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Bulletin of the Taylor Society

A Society to Promote the Science of Management

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CONTENTS

Spring meeting .... Page 1
Comment and News .... Page 2
Two foreign letters of timely interest ...... Page 3
"Discipline on the Border," by Paul B. Valle .... Page 4
"Control and Consent"—Discussion by Robert B. Wolf, George D. Babcock, A. J. Portenar, Richard A. Feiss, Edwin Devine and Henry P. Kendall .... Page 5
"A Note on Routing," by Morris L. Cooke. Page 21
"Physician, Heal Thyself," by Henry W. Shelton .... Page 23

SPRING MEETING

The spring meeting of the Society will be held in Syracuse at the Hotel Onondaga, Friday and Saturday, May 18 and 19. A summary of the program follows:

Friday, May 18th

8.00 P. M. Papers describing certain management mechanisms which will be seen in use in the Franklin Automobile plant on the visit Saturday morning. These include:

"Routing."

"Schedules and Control," including Operation of Control Board.

"Despatching," involving Pneumatic Tubes and Material Transportation.

"Employment Work."

Saturday, May 19th

9.30 A. M. Visit to plant of Franklin Automobile Company.

12.30 P. M. Luncheon, Hotel Onondaga.

2.00 P. M. **"Wage Rating."**
By George D. Babcock, Production Manager, Franklin Automobile Co., Syracuse, N. Y.

6.30 P. M. Dinner, Hotel Onondaga.

8.00 P. M. **"Who is Boss in Your Shop?"**
By Morris L. Cooke, Consulting Engineer, Philadelphia, Pa.

Headquarters for this meeting will be at Hotel Onondaga, East Jefferson and Warren Sts., Syracuse, N. Y. Rooms should be reserved not later than May 11th.

All of the sessions will as usual be open to guests, including ladies. Members are requested to send to the secretary, as soon as possible, the names of guests who should be invited. Additional information as to local arrangements may be obtained from the chairman of the local committee, Mr. George D. Babcock, Franklin Automobile Co., Syracuse, N. Y.

COMMENT AND NEWS

SPECIAL NOTICE

The photogravures of Frederick Winslow Taylor, the execution of which has just been completed by A. W. Elson & Co., Boston, are now in the hands of the Society ready for distribution. Those who knew Mr. Taylor best consider this a most satisfactory portrait. It measures 6½ in. x 8 in. mounted on a heavy white card 12 in. x 15 in. One or more copies will be sent postpaid from the secretary's office, upon receipt of the price, $1.00 each.

The Syracuse meeting gives promise of being one of the largest ever held. In order to secure satisfactory accommodations, reservations should be made early, either through Mr. George D. Babcock, Franklin Automobile Co., Syracuse, N. Y., chairman of the local committee, or direct to Hotel Onondaga, Syracuse, N. Y., headquarters.

The past practice of allowing members 50% discount on all Bulletins purchased, with additional discount for quantities, can no longer be continued, owing partly to the general increase in the cost of production. The Bulletins are now costing the Society so closely the printed selling price that no further discounts will be allowed except in the following quantities: Ten copies or more, 10% discount. If more than twenty-five copies are desired, members should, wherever possible, order definite quantities in advance of publication. In this case, special prices will be quoted, based on cost.

THE BOSTON MEETING

Past experience has again proved no criterion from which to judge of the future in providing accommodations for the members and friends of the Society. The preparations made by the local committee were taxed to the limit at the Boston meeting, with an average attendance as great as the annual meeting last December in New York. This is some indication of what may be expected in the way of growth for the year to come. As has already been suggested, the indications point to a record breaking attendance at the Syracuse meeting, May 18 and 19, and those who wish to attend are urged to make early reservations.

Mr. Hathaway's presentation of a paper on "Maintenance of Machines and Equipment as a Part of the Taylor System of Management," brought forth such discussion that one guest present, who had come from a city more than a thousand miles away, expressed the idea that it was worth ten times the expense to get the information and suggestions made at that time. The only criticism suggested was that a visitor not familiar with the high degree of standardization inherent in the application of the Taylor System would not appreciate that Mr. Hathaway was talking about a refinement in technique. This refinement, important as it is, is a matter which in the ordinary shop would not be considered even a possibility. Naval Constructor Frederick C. Coburn, of the Charlestown Navy Yard, opened the discussion.

There was standing room only and little of that in the special car which carried more than fifty of the members to the Waltham Watch Co., Saturday morning. The careful preparation which had been made by the management of that plant resulted in a complete tour of inspection in groups small enough to have special matters of interest carefully explained by the conductors. Late in the morning all the groups were assembled in the company's reception room where President Fitch made a short address of welcome and refreshments were served.

The following resolution was unanimously voted at the meeting in the afternoon:

> "Voted, that the Secretary be instructed to convey to the Waltham Watch Company, and particularly to President E. C. Fitch, Treasurer H. L. Brown, and Mr. E. L. Folsom, and those who guided the party through the plant, the sincere acknowledgment of this Society for their courtesy and hospitality in connection with the visit of this forenoon."

After the buffet luncheon at the Engineers' Club, the paper on "The Tabor Beneficial Society" was presented by Mr. Herman J. Hutkin of the Tabor Manufacturing Co., and developed a large amount of very valuable discussion, opened by Mr. Alfred B. Rich of the Dennison Manufacturing Co.

"The Manager, the Workman and the Social Scientist," the paper presented by President Person at the close of the afternoon session, was discussed in the evening, after dinner. Among those who took part in the discussion were Henry C. Metcalf, Professor of Economics, Tufts College, Medford, Mass.; Cecil Gregg, President of Evens & Howard Fire Brick Co., St. Louis, Mo.; H. K. Hathaway, Vice-President of Tabor Manufacturing Co., Philadelphia, Pa.; Felix Frankfurter, Professor of Humane Law, Harvard Law School, Cambridge, Mass.; John A. Fitch, Industrial Editor, "The Survey," New York City. The Society regretted that several of those who were on the program were unable at the last moment to be present, particularly regretting the absence of Mr. Henry Abrahams of the Boston Central Labor Union, Boston, Mass.

Inquiry has been made as to whether there has been developed a mnemonic classification on Law. Anyone who knows of the existence of such a classification or authoritatively that such a classification has not been as yet attempted will confer a favor by advising the office of the secretary, who will transmit the information to the inquirers.

TWO FOREIGN LETTERS OF TIMELY INTEREST

ITALIAN GOVERNMENT COMMISSION

Sezione Italiana Della "Commission Internationale De Ravitaillement."

EMPIRE HOUSE,
KINGSWAY,
LONDON, W. C.
FEBRUARY 14TH, 1917.

MISS FRANCES MITCHELL,
SECRETARY F. W. TAYLOR CO-OPERATORS,
BOXLY, HIGHLAND STATION,
CHESTNUT HILL,

PHILADELPHIA, PA.

DEAR MISS MITCHELL:

In 1913 Frederick Winslow Taylor gave me the authorization to translate into Italian his books. I started my work with the translation of his fundamental book, "Scientific Management," of which a second edition in Italian has just been issued. I take pleasure in forwarding you a copy.

I may add that Taylor's principles applied to our factories, as well as the French ones, have materially contributed to the increase of the production of our war materials, a contribution to our victory.

I continue to cherish the study of Taylor's principles; and shall certainly be very grateful if you will send me here in London, where I am presently on my Government services, whatever is being published about Taylor, his principles, and their application.

Thanking you very much for your courteous letter of the 15th of October last, and pamphlet therein, I beg to remain,

Sincerely yours,

(Signed) GIANNINI.

EXTRACT FROM LETTER RECEIVED FROM H. LE CHATELIER, DATED JANUARY 18, 1917

"I am pleased to be able to say that since the start of the war the ideas of Mr. Taylor have made great progress in France. His principles of management are being applied in a great number of plants working on war materials.

"Taylor's books are being sold as though they were appearing for the first time. We have just printed the ninth thousand of the Principles of Scientific Management and the fourth thousand of the April number of *La Revue de Metallurgie*—which I had consecrated to a review of the application of scientific management to industry."

MR. HATHAWAY'S COMMENT ON THE EXTRACT FROM MR. H. LE CHATELIER'S LETTER DATED JANUARY 18, 1917

This statement of Mr. Le Chatelier's is typical of reports that I have been receiving from various sources as to the widespread application being made in France of the Taylor System. While it is very gratifying indeed to know that Taylor's work is appreciated in such a practical way in France, at the same time it seems to point out to American industry the need of a more extensive adoption of the Taylor principles, and particularly to emphasize the seriousness of the mistake being made by American labor organizations and by legislators in their opposition to these methods as indicated by the recent anti-stop watch legislation and opposition to the application of the Taylor methods to Government work.

While personally I feel the keenest sympathy for the French people and have the heartiest desire to see them succeed industrially after the war and to have them adopt any means which will help in their recovery from the loss and damage they have suffered as a result of the war, at the same time I do not like the idea of any other nation surpassing us in the industrial world. If European nations after the war generally adopt and apply throughout their industries the Taylor Methods and we neglect to do so in this country it is absolutely certain that we shall not be able to compete with them.

DISCIPLINE ON THE BORDER[1]

A HINT TO MANAGEMENT

BY PAUL B. VALLE[2]

It is not my intention in this paper to comment upon the weight that the mobilization of the militia threw upon the scales of our relations with Mexico. We are nearly as much in the dark now in that matter as we were four months ago. But we do know something more about ourselves as a Nation, and we have begun to realize some of our shortcomings.

The President's call last June brought to the Border many thousand men comprising the militia, supposed to be our second line of defense. We had been at the border but a few hours when we realized our helplessness to defend anything—even ourselves. As one of the regular Army Officers stated, on viewing our gyrations at the drill ground, we were a howling mob; we were half of us half trained, we were half of us unembarrassed by any training whatsoever. We were in our woolen uniforms in the hottest of Arizona weather, some of our rifles could shoot straight, some could shoot around a corner, some could shoot from both ends, and some could not shoot at all. We were in a strange country and a strange climate, living a new life, and personal hygiene was sketchy to say the least. Men who had worked indoors in factories, at desks, in school rooms, were handed picks and told to dig. One's superior officer was perhaps one of the underlings in one's office or factory. But he did not behave toward us as such. Our mental equilibrium was destroyed.

And so they set to work to make soldiers of us. It was a matter of routine to supply new equipment, but it was a long time coming; it was over a month before we were issued summer clothing and new rifles. And it was a matter of patience to teach us drill and a matter of perseverance and tact to teach us personal hygiene. I distinctly remember one incident in regard to the latter. Two of our five senses told us that one of the men was in dire need of a bath. We modestly hinted, patiently argued, and boldly ordered him to remedy his shortcoming, but in vain. Finally, we gave him a bath. He was quite ill for several days. (We could never be certain how things were going to affect people down there). But near the end of our service, this same man was the loudest in his grumbling if our march happened to take us to some spot in the desert where there was enough water for drinking purposes only.

But the greatest task of all was the teaching of discipline. Introducing Scientific Management into an old-time shop of the traditional type is a summer afternoon's pastime compared with this. It is my belief that in this most vital thing the greatest mistake of our training was made and I am writing this paper because I think that we, in management, can profit by this mistake. If there is any one thing that we young men in this country, and especially in industry, need, it is discipline, and discipline of the right sort.

I think that it has been a tendency with most of us in reorganizing a shop to try to maintain discipline by rule-of-thumb methods, all the while we are berating rule-of-thumbism in the technique of the management. Discipline on the border was of course, as has always been deemed necessary in military organizations, most obdurately rule of thumb.

I said a right sort of discipline. I do not mean a less stern discipline, one that could not duplicate a Charge of the Light Brigade, for it must be that kind if we are face to face with war—even an industrial war. But I mean a discipline taught in a new way, arising in a fundamental basic belief that an order must be obeyed because there is a reason behind it, not because it *is* an order. It cannot any longer mean the blind unreasoning obedience of before. We have been educated in this country individualistically, each for himself as a detached unit, we have been taught that we must create our own destiny—not with a thought of cohesiveness, of our relation to the rest of the community, the Nation, or mankind, but, we must confess, with the idea of self and the work for self predominant. If our ideals are high ideals good reflects to the community, if our ideals are lower, the community suffers. We like to think of ourselves as a law unto ourselves, and not as a tiny expression of a composite whole. And when a crisis comes, as it did last June, when we *must* learn, it was "hard to kick against the pricks" of this same education.

This is how they went about it. We were given picks and shovels and ordered to dig roads and ditches, and bury dead horses and mules and garbage. We dug holes and filled them up again. "Why?" we would ask. "Those are the orders," would be the reply. They would order us to put up a tent and after that had been done with much pain and labor, they would order us to take it down again and put it up again a few inches to the right or left. "Why" we would ask. "Those are the orders." We were told that during our free hours we could not leave camp without passes, which we could get, say, once a week. "Why?" we would ask, very indignantly, for wasn't our time off duty our own to do with as we pleased? "Those are the orders," said the sphinx.

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[1] A paper read at the annual meeting of the Taylor Society, New York City, December 9, 1916.

[2] Acme Wire Co., New Haven, Conn.

We were taken on long marches and at the end of a hot dusty day, we would see water—the first water in fifteen or twenty miles perhaps. With our canteens dry and licking our lips in anticipation we would increase our pace, when a fateful voice would be heard, "you men keep back from that water, and let the mules and officers drink." "Why?"—"Orders." All these things and many more we were made to do.

We soon stopped asking why because we knew the answer by heart. When that stage of the game was reached it began to be demoralizing. And also a strange viewpoint was taken of the matter by the rank and file of the enlisted men—and I tell you managers and managers of managers that the men in some of your shops where you are introducing the Taylor System have that same viewpoint today: *that the officers themselves didn't know why.*

Then one fine day a certain Lieutenant-Colonel of the 12th U. S. Infantry came ostensibly to teach us guerilla warfare. He formed the regiment into a hollow square and gave us a talk. And he told us why. He told us that we were made to dig ditches and bury garbage and furl our tents every day and bathe periodically in order that we might, if the time came for war, know how to keep away disease. We had been drilled and marched and counter-marched by the hour and day and week, so that when an order came in battle we would execute it automatically. We had been sent on long trying hikes to harden us for campaigning. And he told us the reason for all these big and little tasks that we had done and when he had finished we cheered him (although it wasn't good discipline to cheer while standing at attention). And from that day on the morale of the regiment was bettered a hundred percent.

Now the point of all is contained in the fervent remark of one of the men after that talk—"Why in hell didn't they tell us that before?" I am willing to wager that if you take the trouble to explain the reason for some of the moves in this Scientific Management game to the men in your factories you will hear the same remark made with just as much fervor. I realize that it is ever becoming the tendency to let the men understand thoroughly what is being done, but the mistake we all of us are making is that we do this too late in the game. Our clubs and classes in Scientific Management among the workers in our factories are started after, not before we have made the biggest steps in the work.

Those explanations, that instruction, should be *first,* and when the men see that there is a good reason behind every move, they will soon stop asking why, not because they get a rule-of-thumb answer, but because they have learned to believe that the "boss" really knows what he is doing after all.

The discipline obtained under the old method in shop will be no better than the discipline of the militia of today, when even after four months of rigid instruction, orders concerning little and big things are being continually disobeyed. Perhaps if we should have a year more in the service we would obey any order just because it was an order, and the same applies to any industrial establishment, but it is without doubt fairer, quicker, better "going" when we take the horse from behind the cart and put him in the shafts.

CONTROL AND CONSENT[1]

A DISCUSSION OF INSTRUCTIONS, INITIATIVE, AND INDIVIDUALISM IN INDUSTRY.

PRESIDENT PERSON: According to the program which inspired you to come to this session, I should now present to you Morris L. Cooke[2]; who would initiate discussion of the relations between management and labor by consideration of the specific topic "Who is Boss in your Shop." Mr. Cooke's unfortunate illness has not merely prevented his presence with us this evening; it has prevented the completion of his paper to a degree which would warrant him in sending advance copies to those who were elected to discuss it. Therefore you must understand clearly that discussion this evening is not a discussion of Mr. Cooke's paper. We do not know what his paper would have told us.

One of the gentlemen who was elected to discuss Mr. Cooke's paper, not having seen Mr. Cooke's paper, prepared independently an outline of his own views on the subject. Fortunately or unfortunately for him, but certainly fortunately for us, I became aware of the outline in his pocket. As a penalty for such preparedness I have advised him that I should call upon him first and asked him so far as possible to convert what was to have been merely a discussion into a leading paper. I give you Robert B. Wolf.

MR. ROBERT B. WOLF:[1] I cannot say that I am not prepared after what Mr. Person has just told you. I had hoped to discuss Mr. Cooke's paper and I regret extremely that his unfortunate illness has prevented his being here. I rejoice, however, with the rest of his friends, that he is on the road to a speedy recovery.

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[1] Discussion at the annual meeting of the Taylor Society, at the Hofbrau House, New York City, Saturday evening, December 9, 1916.

[2] Consulting Engineer, Philadelphia.

[1] Manager of Manufacturing, Burgess Sulphite Fibre Co., Berlin, N. H.

With respect to the relations between manager and employee, I have a feeling that there are certain things in the minds of some members of this Society that are somewhat contrary to my own convictions. My convictions are based upon what we are actually doing in our mills at Berlin and are also based upon my three or four years' experience immediately after graduating as an Engineer in 1896, when I was working at the paper trade in various mills in New York State and New England. It was this experience as a workman that enabled me to realize the employee's point of view, and I feel that having been a workman myself I am qualified to speak for him.

I am going to begin by referring to Mr. Green's paper at the October meeting and the discussion of that paper.[1] Mr. Green has certainly worked out a practical method for recording the beating of stock in a paper mill and I consider that he has done a fine piece of work. There are, however, certain things in his paper which make me feel that he is advocating an attitude towards the workman not in accordance with the best principles of management. There seems to be in his mind a desire to put too much emphasis upon the giving of *minute detailed instructions* to the men, which do not allow them sufficient latitude to use their own creative imagination. In order to bring the subject before you more concretely, I am going to read an extract from Mr. Green's paper and my discussion of it published on page eight of the October BULLETIN, as follows:

Mr. Green says:

"'We on the management side have the means of directing *in detail* the treatment of *every batch of stock* in *every beater, day and night,* and of taking the *full* responsibility *which belongs to us* for the results.'"

upon which I commented as follows:

"Our efforts, ever since we began to realize the workman's point of view, have been not to take responsibility from him. It is our plan to increase his responsibility and we feel that it is our duty to teach him to exercise his reasoning power and intelligence to its fullest extent. There is *no advantage gained by stimulating a man's reasoning power, and through this means his creative faculty, if the management relieves the man of the responsibility for each individual operation.* The opportunity for self expression, which is synonymous with joy in work, is something that the workman is entitled to and we employers who feel that management is to become a true science must begin to think less of the science of material things and think more of the science of human relationships. Our industries must become *humanized,* otherwise there will be no relief from the present state of unrest in the industries of the world.

"In this connection it might be well to observe that our experience in the pulp industry has been that instructions which go *too much into detail* tend to deaden interest in the work. We realize fully the value of sufficient instructions to get uniform results, but we try to leave as much as possible to the judgment of the individual operator, making our instructions take more the form of constant *teaching of principles* involved in the operation than of definite *fixed rules* of procedure. It is necessary to produce a desire in the heart of the workman to do good work. No amount of coercion will enlist him thoroughly in the service."

* * * * * * * *

"The new efficiency is going to reckon a great deal more with the needs of the individual man; but in order to do this, it must have some philosophical conception of the reason for man's existence. *It is beginning to be understood that when we deny to vast numbers of individuals the opportunity to do creative work, we are violating a great universal law.*

"Man never creates matter or force, but he does create conditions for the expansion of these great primary universal forces and it was for this purpose that man, considered generically, was created. The degree of efficiency of an organization, therefore, can be measured by the extent to which it permits the individual men in its employ to do creative work, which as I said before gives joy to the worker because *it gives him an opportunity for self expression.*"

Professor Drury's paper, which appears in the November BULLETIN,[1] gives expression to the same thought in more concise language; and I would like to say right here that while I differ from him in some slight unimportant details, on the whole his paper struck a very responsive chord in my own heart. The following is a quotation from his paper:

"The ideal of securing individual efficiency through restraint and command will have to give way sometime before the more efficient program of opening the way for individual self expression. Not that no one should lay out tasks for others; or that vast numbers of workers should not make their methods conform closely to one most efficient standard. An opera singer may fittingly follow the directions of her managers as to routes of travel and concert dates; a great engineer or builder may conform in detail to specifications drawn up by others. The point is that while one individual does many things that others plan, he should have some things to plan himself. That is what man is for. *To neglect to utilize and develop the unique originating, choosing, and adapting power with which every individual is more or less endowed is to waste the earth's greatest resource,* for which the growing complexity of industry and the arts will ever make greater demands. Besides, to deprive man of the opportunity to create is inhuman, degrading and destructive for the individual, the ruination of pleasure in work, of romance and achievement in life."

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[1] Bulletin of the Taylor Society, Vol. II, No. 3 October, 1916.

[1] Bulletin of the Taylor Society, Vol. II, No. 4, November, 1916.

I have reached the same conclusion as Professor Drury, with reference to recognizing the inherent right of every man to exercise his creative faculty and thereby realize the sense of joy and freedom which can come only through expressing one's self in the day's work.

I do not believe that I am open to the criticism of being impractical, for my conclusions have been reached while in actual daily contact with management problems.

Professor Drury's clearly expressed statement sums up what seems to me to be one of the most important phases of management and I believe that the criticism which my discussion of Mr. Green's paper brought out at the Philadelphia meeting, justifies to quite an extent his contention that we have not been scientific enough in dealing with this very important subject of stimulating the thinking, reasoning power of the workman, thereby making him self-reliant and creative.

The criticism of. my written discussion of Mr Green's paper at the Philadelphia meeting, in October, showed clearly that quite a few members of this Society do not realize what it means to the workman to be denied the opportunity to do creative work. By this I mean the kind of work in which he can express himself, through being furnished with means for realizing his progress; work, in other words, which appeals to his reasoning power and intelligence.

The statement was made that I am fundamentally wrong in my discussion of the theories of management because I place so much emphasis upon this point, so I am going to make an effort to show why I believe this individual creative process must be recognized and consciously dealt with. The members of this Society, I am sure, are giving much more opportunity to the workman to use his initiative in the performance of his work than they realize, otherwise they would not be successful managers. I believe it necessary, however, to call attention to the danger of carrying the realm of so-called scientific facts, or "exact" science beyond its proper sphere.

In order to show you why I believe we are pushing the realm of "facts" into a field where it does not belong I have brought with me some charts which will illustrate what I mean. Before showing these charts, however, I should like to define what it seems to me we can classify as three great fields, or forces, which we managers are working with, and their relationship to one another.

The first we may call the field of nature and in this field the natural or generic, laws are the great dominating factor. It is the function of scientific research to discover and record these laws, which have to do with the character of our raw materials and the effect of the various conditions of manufacturing upon the conversion of these raw materials into the finished products. These laws in the field of nature are recorded in such sciences as chemistry, physics and mechanics. Mr. Taylor's classic analysis of the factors entering into the art of cutting metals was clearly an exploration into this field.

The second field has to do with what has been designated "The Will of Man." This will is essentially free and creative in essence, and has dominion, as it were, over the generic law in proportion to its intelligence. In other words, man's power to change the destiny of nature depends upon his knowledge of the laws of nature and his wisdom and intelligence *in creating conditions for* the specialization of these laws. It is our failure to recognize this "originating, choosing and adapting" power and to direct it scientifically into positive constructive channels that has caused it to turn into a negative, destructive force, retarding the spiritual development of the human race.

The third field, or power, is much more difficult to define, but it no less than the other two is a distinct aspect of life. We might define it as the great universal, unifying principle, of which the self conscious faculty of man is a particular manifestation. In our industrial organizations its emanation shows as what we call "esprit-de-corps," and it is generated by instilling into the minds of the men in the organization a consciousness of their place in the great scheme of things and a willing desire to co-operate with their associates. In other words, we must plan to develop not only the self-conscious faculty of our men, but also a consciousness of their unity with the whole: a sort of universal consciousness, as it were. Organization consciousness, or plant individuality, can be genuinely obtained only when this power is thoroughly recognized.

It is my intention this evening to deal principally with the first two aspects of organization work and to give you, to begin with, a few illustrations of what we look upon as the natural, or generic field; then show how when we obtain a knowledge of this field we make it possible for a *constantly increasing* number of men to utilize this knowledge. In this way it is possible for them to assist us to create conditions which make for more efficient operation.

I am under the impression, from remarks that were made at the Philadelphia meeting, that some of my friends here feel that we are not scientific enough in our plant. I hope to dispel this misconception by giving you four illustrations, which are typical of hundreds of others, showing the nature of the work that we are doing.

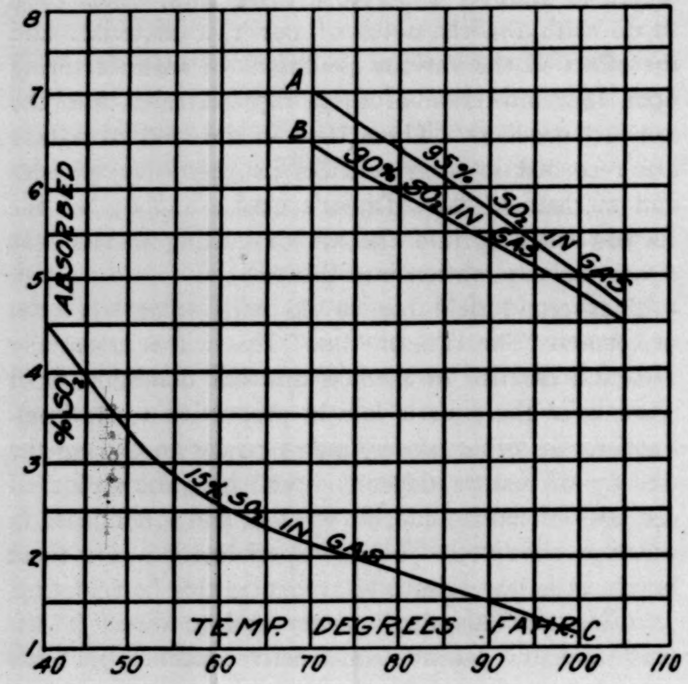

FIGURE 1.
Chart Showing Laws of Absorption of SO_2 in Water.

Figure 1 shows the result of a long series of experiments that we made to determine the laws that have to do with the absorption of SO_2 in water. It was only after we had determined the exact effect of the temperature of the water and the percent of SO_2 in the gas upon the amount absorbed that we were able to create the special conditions in our plant whereby we increased the percent of free SO_2 in our cooking acid from two and a half percent to six and a half percent. In order to accomplish this it was necessary to change completely the character of our acid making apparatus and this was all done within a very short time, because of the freedom that was given to the men actually operating the acid plant to help us create the necessary conditions to obtain the desired results.

It is unnecessary for me to describe to you in detail the immense amount of research work that we were obliged to do to determine the necessity for a stronger acid with which to cook our pulp. I will simply say that our exploration, which took us, of course, deeply into the realm of the natural, or generic law, showed clearly that the maximum temperature in the cooking operation had a great deal to do with the yield of cellulose we obtained from a cord of wood. There were, of course, many other factors that had to do with the character of the pulp turned out of the digesters and you can easily imagine that with nine different men cooking (three men on a shift and three shifts during 24 hours) we got nine different kinds of pulp, since each man had his own particular notions about how the work should be done. The first thing we were obliged to do was to agree upon some standard method of procedure. By coöperating with the cooks, we finally decided upon a set of uniform cooking instructions. We worked up a system of graphical charts, which the men themselves plotted as the cooking operation progressed, and in a comparatively short time obtained a degree of uniformity which was absolutely impossible under the old conditions. We further were able to get a lower average maximum temperature and increased our yield from a cord of wood from five to seven percent, by this first step of simply introducing uniformity into the cooking operations.

The charts (and recording instruments from which the charts are plotted) you can see, simply made it possible for the creative faculty, which belongs to the field of "The Will of Man," operating through the cooks, to guide and direct the reactions in the digesters in such a way that the desired results were obtained and these results came only because we produced a desire on the part of our men to do good work, by first educating them to a knowledge of the chemical and physical laws which entered into the cooking operation, and then giving them some means of recording their progress. A man who constantly sees the result of his efforts cannot help doing creative work.

We found, however, that in order to lower our maximum temperature still further, to get a still greater yield, it was necessary either to lengthen the cooking time or to increase the strength of the acid. The former affected our production too seriously to be considered, so we began investigations which resulted in the determination of the laws affecting the absorption of SO_2, as illustrated to you on the chart which you have just seen. The final result of obtaining this stronger acid was to bring about a drop in our maximum cooking temperatures of an additional twenty degrees, and finally an increase in the amount of cellulose obtained from a cord of wood of over seventeen percent. Of course, all of this was not due to the cooking and acid making, as other changes were made in our wood preparing and bleaching departments, all of which contributed to the final result, the work in these other departments being carried on in the same manner as the work I have just described in our digester building and acid plant.

The net result of all this was an increase in our production from 225 tons per day of the poorest quality of fibre to 400 tons per day of fibre which to-day is recognized as a standard of excellence all over the world. This was done without adding a single digester or putting in a single additional wet machine for handling the finished product. Of course, the physical equipment of the plant was changed very radically; in fact, with the exception of the digesters and wet machines just mentioned, there is hardly anything left of the old equipment. In our wood room practically everything has been changed,—the method of barking wood, chipping wood, screening and sorting it; our entire bleaching plant has been rebuilt, a different method of bleaching being used; our entire acid plant has been changed so completely that anyone who has not seen it since seven or eight years ago would not recognize it at all. I am merely mentioning these things because they are important in showing how the creative faculties of the men, turned loose and given freedom for self expression, will work wonders in a comparatively short time. It was the accumulation of knowledge regarding the laws that are essentially a part of the "natural, or generic field" and then bringing the knowledge of these laws to the attention of the second great field, which we may call "The Will of Man," and the utilization of this great creative force that has brought about such wonderfully rapid changes in the physical equipment of our plant.

Some of you may feel that any organization which is making scientific investigations, and has a department for that purpose for the information of its executive branch, will get results; but our experience has been that unless the free will of the working force, which expresses itself in creative power, is consciously utilized, these results will not be obtained to any appreciable extent. I have had personal experience in one or two large industrial organizations that have splendid equipments for doing research work, where hardly a single change has been made in the manufacturing processes and where no improvements have been made in obtaining larger yields or appreciable betterments in quality for fifteen or twenty years, all because these laws worked out by their highly specialized research department were not made available to the men; and where they were made available, the men themselves had not the opportunity to assist in creating the new conditions necessary for the specialization of these laws.

To illustrate further our investigations in the natural or generic field, I submit Figure 2, a chart indicating the result of our research work on the effect of velocities upon the conductivity of lead tubes. We have succeeded in increasing the conductivity more than twenty times as a result of this work and I want to call your attention to the fact that, as a pulp mill, we designed and built a condenser of lead with a conductivity more than twice as great as the best guarantee we could obtain from manufacturers of copper condensers.

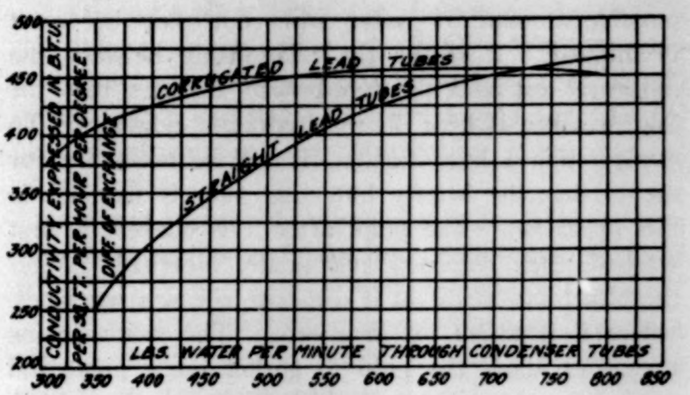

FIGURE 2.
Chart Showing Effect of Velocities on Conductivity of Lead Tubes.

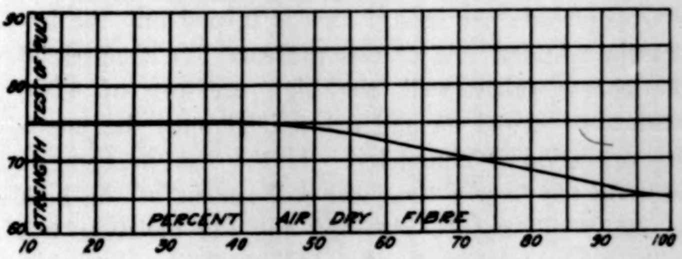

FIGURE 3.
Chart Showing Effect on Strength of Fibre of Increasing Temperature of Pulp.

Figure 3 shows the effect upon the strength of our fibre of increasing the temperature of the pulp in order to drive off a larger amount of water on our drying cylinders. This chart requires no further comment, except that as a result of this work we are completely redesigning this machine.

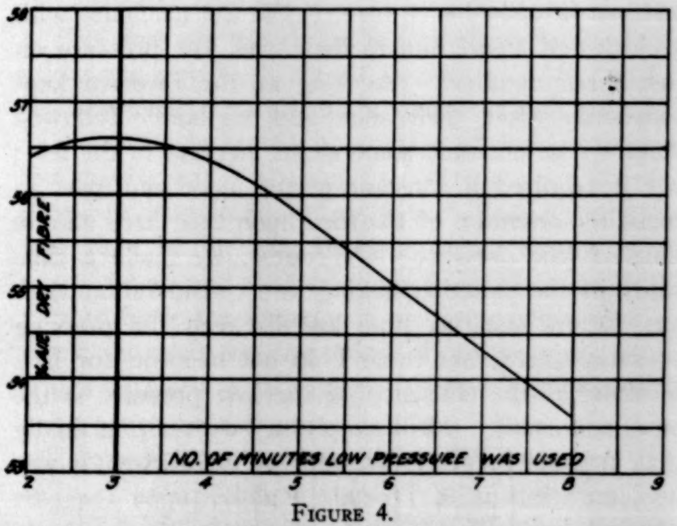

FIGURE 4.
Chart Showing Relation Between Moisture Test and Duration of Hydraulic Low Pressure.

Figure 4 has to do with the operation of our hydraulic presses, where we squeeze out the last possible amount of water from our pulp before it is shipped. It shows the relationship between the moisture test and the number of minutes that the low pressure is kept on the hydraulic cylinders. To explain this a little further, it will be necessary for me to describe briefly how our pulp is handled in this operation. The pulp, after it is cooked, is first washed, then screened and finally bleached. After the bleaching operation it comes to the wet machines, where it is taken off in sheets. The wet machine operators allow the pulp to gather on a press roll until it reaches a certain thickness, then they cut it off and fold it up. These separate folded laps are stacked up on a press pan, with cocoa fibre mats between them, until the proper height is reached.

The mats are for the purpose of allowing the water to pass out at different points in the package. After this package (or "cheese" as it is called) is completed it is pushed under the hydraulic press and a pressure of 750 pounds per square inch is turned into the hydraulic cylinder. After this pressure has compressed the cheese fairly well, the high pressure of 4,000 pounds is turned on and maintained until the pressing operation is completed. If the low pressure is kept on too long a time, the full benefit of the high pressure will not be obtained and the moisture test will drop. On the other hand, if the high pressure is put on too soon the water will squirt out of the pulp so rapidly that it will tear the cheese apart and break the cocoa fibre mats, and the moisture test consequently will be low. Our problem was to determine the best length of time to keep the low pressure on, as the high pressure is governed entirely by the production coming from the wet machine. After having determined that three minutes of low pressure, as illustrated by the chart, gives the maximum moisture test, we furnished each man on the wet machines with a clock and asked him to leave this low pressure on just three minutes. As long as the foremen kept constantly after their men and vigilantly followed them up we obtained some slight increase in the test; but it required a constant urging upon our part to focus the attention of the men upon this three minute time of low pressure. Of course, we made a time study of the situation, taking into consideration various factors such as time lost between the pressing operations, etc., but these I do not mention for lack of time, as the efficiency of the low pressure is the most important. I will simply say we realized finally that in order to get the results we were after, it was necessary for us to *produce a desire* upon the part of our men to do this work in the proper way,—in other words we had to pass from the natural or generic field into the field of the will of man,—so we designed an instrument which would give us a record of the time lost between pressing operations, also the number of minutes the low pressure was kept on. It took us something over a year to perfect this machine, but after it was finally perfected and a record of the operations made, we found that the men actually were operating at an average efficiency of 42 percent and our moisture test was running about 54 percent. Our next step was to post a daily record of the relative standing of the men in the machine room, putting the men who had the best record at the top of the list, in the order of their weekly average efficiences. (The efficiency of low pressure, which proved to be the most important factor, was computed by calling three minutes of low pressure 100 percent and two minutes either way 0 percent). As a result of simply posting this record our efficiencies rose to over 60 percent and our moisture test increased a little less than one percent. Some of the best and most skilled men had an efficiency of over eighty percent, but quite a large percentage of them were down below 50 percent. We therefore decided that it was necessary to have the foremen give more detailed information to the men as to what the machine meant and how their efficiencies were obtained, and to put the instrument which did the recording into a glass case in the machine room where all the men could see it. Each foreman took a portion of the chart and one of the celluloid scales by which we obtain the efficiencies and explained in detail to each one of the men how their records were calculated. As a result of this our efficiency rose from 60 percent to 80 percent in less than four weeks and it has remained at 80 percent ever since, enabling us to get a moisture test of over 56 percent.

This was accomplished without resorting to piece work, task or bonus, or any of the regular special methods of payment, our men being paid by the day throughout the entire plant. The interest that was taken in the work came absolutely because the men were being furnished with a record of what they were accomplishing, and in the formation of this record there was opportunity for them to express themselves.

In other words, we were working with "The Will" and producing a desire on the part of our men to get the results we were after. A spirit of emulation was brought about through the posting of the records; but, based upon our experience in this and also in other departments, we know that most of the increased effort came from the joy the men were obtaining by being able to see the result of their work.

The posting of these records has been going on now for over two years and there has not been the slightest diminution in the interest the men are showing in their work. We have further noticed a very marked improvement in their attention to other factors in the machine operation, such as reduction in the cost of machine clothing, general neatness of the room, etc. This is all due to the fact that the men are focusing their attention upon their work, because they have something to interest them.

I hope I have been able to indicate to you how we have made a very uninteresting and monotonous routine job interesting to our men, and hope that this illustration has made it clear to you just where we began to enter the second great field, which I have called "The Will of Man," and consciously utilized the individual creative power, which in so many cases is latent or actually working against progress in the organization.

While it is possible under certain conditions to compel obedience, there is no possible way in which a man can be *compelled* to do his work willingly and when he does it unwillingly he is very far from being efficient. He must have the opportunity to enjoy his work and to *realize himself* in its performance.

It is no longer necessary in our machine room for us to follow up the men and make them feel that pressure is being put upon them to get results. The desire, as it were, comes from *within themselves* and as this spirit permeates our whole organization it keeps the foremen and department heads busy *leading* the men in the right direction.

A remark I heard Mr. Babcock, manager of the Franklin Automobile company's works, make yesterday illustrates this point very clearly. Someone was asking him "who was boss in his shop" and while I do not recall the exact wording of his reply, it was to the effect that the men themselves ran the shop and the management was kept busy leading them in the right direction. I have never seen such wonderful esprit-de-corp in any machine shop as I saw during my recent visit to his plant, and I am sure that it is due to the fact that he is in every way coöperating with his men in making his time studies and determining standard practice methods.

In our plant we never make it a practice to *arbitrarily* determine standard methods for performing an operation, for we believe that the men who are actually doing the work have generally as much to contribute as the foremen and department heads in deciding standard practices; and because we give the workman a chance to have the most to say about the matter he is willing to conform to the standard, because it really represents a concensus of opinion of the men in his particular group.

Mr. Barth made the statement to me at our Ann Arbor meeting that he believed that fully eighty to ninety percent of the coöperation obtained from the men came from giving them a record of what they are accomplishing. I am sure that Mr. Barth, who is here, will not hesitate to correct me if I have misquoted him.

I do not wish to leave the impression that we do not believe in rewarding our men. We pay them much more than they are paid in any other branch of the paper industry and we are glad that the increased efficiency of the plant makes it possible for us to do this.

I am not necessarily opposed to piece work or task and bonus methods of payment. There may be cases when it is desirable to use these methods.

I do want to point out, however, that we have been able to obtain splendid results without resorting to a system of immediate money reward and that I believe we should seriously consider whether or not it is wise to keep the almighty dollar constantly before the workman, thereby stimulating his selfish instincts. Is it not perhaps better to pay him liberally so that he can forget this economic pressure and do good work because of the joy that comes from the consciousness of a work well done?

It is in the formation of standard practice and time study that we need to exercise the greatest care. The realm of positive science does not extend into this field. It is the field which is essentially occupied by the will of man, which we must never fail to recognize as free in essence. I believe the principle function of time study is to furnish some means for recording the progress of the workmen. This is the reason why it is necessary, in order to obtain the best results, to have the workman feel that the proceeding decided upon as best actually is the best and represents a concensus of opinion of the men on the particular job.

After several years experience as manager I have come to the conclusion that no matter how skillfully the management determines the one best way to perform an operation, it ceases to be the one best way if the workman does not want to do it that way.

This does not mean that in our plants in Berlin we allow our men to go ahead in their own way to find out how their work should be done. We do give them very careful instructions covering all we know about the operation they are about to perform; but in giving them these instructions we never allow ourselves to lose sight of the fact that they must not be in *too much detail*, and that freedom is given to the workman to leave the impress of his personality upon the work, or upon the formation of the progress record which indicates how near he conforms to the standards, which he recognizes as ideal. There can be no self expression otherwise and the purpose of carefully recording the progress of each operation is to enable the workman to know the effect of the conscious application of the creative urge, which lies at the very base of his individuality.

I hope that these illustrations of our methods, which I have just described, will convince you that it is necessary to give to all workmen a chance to develop their own individuality and thereby to work from *within out,* instead of merely reacting to externally applied force. This premise being accepted, it is obviously necessary for a *thoroughly scientific* management to consciously put more responsibility into the hands of the individuals throughout the organization and to cease its efforts to control *all the minute details of manufacturing,* by orders issued from a central planning department.

There can be no intelligent control of details unless this is done, for it is through the individual that the universal invariably manifests in dealing with a particular situation, and this universal principle of unity, which represents the third field, is reflected in our organization by the central governing body.

We must put more responsibility into the hands of the individual men throughout the organization. It is only in this way that *normal men* can be developed.

I do not mean to abandon the idea of functionalization, but that it should not be carried to its extreme. It is an old axiom that anything carried to its extreme becomes its opposite.

A man who is a specialist in only one line, and who does not realize the relationship of his work to his whole environment, is *not* a normal individual and lacks judgment and creative ability. The medical profession is a typical example of the absurd results obtained by over-specialization and it is rare to find a doctor today who knows a normal individual when he sees one. I am not advocating a return to the old order of things, where each man turned out a complete finished article. It is not necessary to do this in order to develop men. It is, however, necessary to satisfy this inherent longing to create, and I maintain that this fundamental instinct can be satisfied and still allow the benefits of specialization to be retained in a large measure. We should, however, educate our men to a greater realization of their place in the organization and the universal scheme of life and this can be done only by increasing their knowledge of the laws of the natural, or generic field, and at the same time by giving them a chance to specialize these laws through the free exercise of "the will."

The difference between what is frequently done and what I am advocating is largely a matter of emphasis. In one case the proceeding is to determine "the one best method" and then give detailed instructions for following same. In the other it is a question of determining, through the aid of science and *in coöperation with the workman himself, the best procedure under the circumstances* and then creating an environment which will produce a desire on the part of the workman to do the work in the manner determined upon. In the first instance we have a controlling system compelling discipline from the top down,—a sort of benevolent despotism radiating from the centre to the circumference, — which requires a very decided expenditure of creative energy from the executive branch merely to keep the organization in operation. This necessarily ties up a good deal of energy which could be used to create better conditions for the advancement of the plant. In the latter case, where the desire to do good work is manifesting in all parts of the plant, it is more a question of leadership and those at the head of the organization find themselves constantly guiding and directing the creative activity which is manifesting itself in thousands of ways, because the men entrusted to their charge are being given opportunity to enjoy their work by having it made interesting for them.

I am not going to attempt to describe to you our method of building up plant individuality, as my paper before the Society in May, 1915, published in the August BULLETIN of that year, describes this thoroughly.

I simply want to say in conclusion that I believe it to be absolutely essential for the development of the human race that the men who are in control of our industries obtain a real conception of the reason for man's existence.

This cannot be brought about by a purely analytical process, which will at best only accumulate more facts which add more or less to the confusion, but by a synthetic process which will enable us to obtain a philosophical conception of what life really means.

If this is done, man (considered generically) will be recognized as a connecting link between the great field of nature, which was prepared for him in order that he might realize himself by mastering its laws, and the great cosmic unifying creative principle which brought the universe into existence. Let us recall again the fact that man never creates matter nor force but he does create conditions for the expansion of these primary universal energies. The universal invariably manifests itself through the individual and it is this originating, choosing, adapting power, which Professor Drury speaks of, which must be developed and co-operated with if we are really to make our organizations thoroughly scientific.

Viewed from this standpoint, we can see why the power to create is absolutely essential to man's development and that any organization which denies to its men this opportunity to express themselves in creative work, cannot be considered scientific; for it is not intelligently enlisting into the service that great intermediate power "The Will of Man."

Mr. Geo. D. Babcock:[1] It is most regrettable that through the illness from which Mr. Cooke is suffering it is impossible for him to be with us to-night, because the issue which was presented by Mr. Valentine's paper a year ago is the issue that still remains in the scale, and it is still going to remain in the scale and swing about the pivot for a long time. I do not not believe that there is any solution for that issue except through scientific study leading to deductions based on facts.

Let us consider briefly how most organization relations develop. Some man of broad perceptions, or having special knowledge, interests his friends in a projected business development. They provide as capital surplus earnings acquired by thrift and economy, probably a pension for later years. Buildings, machinery and fixed equipment, materials, and markets are acquired. The public is notified that new opportunities for employment are offered. The first workmen are usually such as see a greater degree of opportunity for advancement with the new manager, whoever he be, than with their employer; their knowledge of the new product or its probable usefulness must be so limited as to remove it as an incentive to change.

Production starts and is carried on for a time with perfect satisfaction to capital, management, and men. The business expands until large amounts of money are involved in fixed equipment, and if unfinished, in unsalable materials. Largely increasing responsibilities in selling, buying, product development, and financing so occupy the manager's time that his personal relation to his working force, which is much more self-maintaining than these inanimate things, all but ceases and a substituted, delegated, and practically unlimited, authority takes its place. Rapidly increasing demands for workmen precludes a selection of those most fitted by environment and training for the particular tasks, so the "unemployed" are admitted. Production problems fill time and mind of supervisors. The public is cordial to the prosperous industry.

With the addition of untrained men costs rise and markets shrink. Spoiled work, careless attendance, and indifference sour the supervisors, already overburdened with seemingly endless duties. The keen wedge of discontent enters to disrupt the human relations of managers and men. Men are "fired" and new ones who find a chance to work are "hired." They enter employment not to satisfy ideals, but to get a "job." They are employed for what they know, not for what they can learn to do. Knowing little they are soon "fired." No such organization is stable regardless of its valuable product, finance, or selling power. Workmen will naturally restrict output, do as poor work as will squeeze through inspection, and if strength comes by might, will group for offense and defense. Emboldened by the first successful results of concerted action, fully appreciating the manager's handicap of immobile fixed investment, limited equitable demands for fair treatment and wages expand to those unreasonable, impossible requirements which succeed to destructive violence.

Suspension of work, mis-payment on bonds—dissolution—fixed equipment and materials—a very limited asset—bankruptcy and ruin to the dependents on capital—loss of employment to the workers—loss of useful, economical, product to the public and their provisioners.

> For the want of a nail a shoe was lost,
> For the want of a shoe a horse was lost,
> For the want of a horse a rider was lost,
> And all for the loss of a horseshoe nail.

Unfortunately this is not in this day a fairy tale. I agree that the boss must be from within and not from without the shop. He must, however, assume his inherent responsibilities, not alone for the inanimate things but for the animate as well.

Dr. Taylor found that nail which was lost.

It is our fault alone if we, as managers, do not drive it into the afflicted foot and clinch it well.

Mr. A. J. Portenar:[1] I do not know whether the story I am going to start with is new or not. No stories are new. There are only six jokes in the world. All the rest are variations. A gentleman came out on the street of a big city and saw a darky standing in front of a store window. He went to him and he said, "Sam, can you change a five dollar bill for me?" The darky answered "No, sir, I can't but I sure do thank you for the compliment." The point is this: That in the Taylor Society I am welcomed as one who can take a point of view which is regarded as frank and honest and that I am not considered as one who must necessarily be *persona non grata*, because I am sympathetic with labor, in fact, a member of a labor union.

My acquaintance with Mr. Taylor began through an approach made by him to me because of a book I had written and which he had read. That book was written by me as a union man speaking to other union men, and the title I intended it to bear was "What shall we do?" It was shortly after the McNamara exposures. I felt it was up to someone to say something and that I was that someone. The publishers in their wisdom changed the title from "What shall we do?" to the very trite one "Organized Labor; Its Problems and How to Meet Them."

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[1] Production Manager, Franklin Automobile Co., Syracuse, N. Y.

[1] Superintendent, Bureau of Employment, New York State Industrial Commission.

However, I preserved everything in the book except the title. Mr. Taylor sent for me and told me that he believed, from what he had read, that I could take an honest view of his system when it was explained to me and that I could be frank enough to say whatever I believed after the explanation. He spent two days with me in his house and took me on the third day to visit certain plants. I will say that the first impression of what he intended to do hit home; that through co-operation would be accomplished the cheapening of production, greater consumption, more employment and more happiness all around. I know that nothing better than that could I ever seek for, and I was very willing to be the listener while he was the expounder. Once in a while, however, we locked horns. After the visit was over I told him that the thing was too big for me to be able to give him an immediate answer; that I would have to go home, think it out, read his books and he would hear from me later. When I had read those books and had digested the notes that I made of our conversations, that first impression of favor toward the system was lost. You may be willing to regard me as a friendly enemy, but I must say frankly to you that at this moment I am an enemy of the Taylor System.

It happened that after my correspondence with Mr. Taylor and his untimely death, the Industrial Commission appointed Professor Hoxie, Mr. Frey and Mr. Valentine as a sub-committee to investigate and report. It also happened that Mr. Hoxie, with whom I had had some acquaintance and correspondence previously, read my letters to Mr. Taylor and wrote me that those letters portrayed a vivid forecast in many respects of what his investigation brought about. When I read the report and found that it was unanimous, my opinions which I admit were not based on practical knowledge and investigation, were greatly strengthened. It was only theory with me, based on a study of principles and methods, but the report of the Hoxie committee confirmed my reasoning.

I have a new book now in process of writing and there is a chapter in it which will be headed "Efficiency." It won't be the usual talk about getting up early and keeping your eyes off the clock, be virtuous and you will be happy, or that sort of thing. It will be principally, almost entirely, a discussion of the Taylor system. I fear you will not like it.

In listening to Mr. Wolf here tonight I concluded that there are heretics among you, or else that what I found to be a very decided dogmatism in Mr. Taylor's books and conversation is being leavened. Either I entirely misunderstood Mr. Taylor's talk and books, or there is a leaven among you. When I hear such expressions as "Self-expression is one of the things the men need; that the industries must be humanized; when the workmen do not want to do it that way it ceases to be the best way," I believe that what I have written will be received by you in a spirit that I had not anticipated. I believe now that if and when that book finds publication, it may and I hope will find readers among you who will see that what I have said about the humanizing of industry has some basis, and deserves a place in your system. I think that Mr. Wolf is absolutely right when he hinted—he did not say it quite as plainly as I am going to—that you have too much system and too little humanizing, and that probably you will find when you have read what I have to say, that that was my principal objection to the Taylor system.

It was Mr. Taylor's intention to ask me to go into plants, look them over and report. I told him if I did anything of that kind I would do it in my own way, and that I would have no leading strings; that I would not be taken to the Link-Belt or Mr. Hathaway's plant and shown how lovely it was. For instance, I declined to be convinced that anybody in those plants did not want to be a member of the union if I had to ask him while I was walking through the plant with the boss. I would never be convinced that way; a walk through the plant with the boss was not my way to get at the real truth of the Taylor System. One of our spats occurred in the street while we were walking to Mr. Hathaway's plant. I said, "You cannot get under the skins of the men"—when he told me how they loved him and everything that was done in real Taylor plants—"you don't know how." He said, "How do you know? I was a working man." I said, "That was thirty years ago." He insisted that he could. I dropped the subject, because I felt that at that moment with my very insufficient knowledge I was not prepared to dispute it; but I disputed it afterward in those letters that we exchanged. And I would dispute it more than ever now, since I have learned that he was not a workingman in the ordinary meaning of the word, although he began at the bottom.

I have heard enough here tonight to assure you that there will be a postscript to my chapter on efficiency. I do not know to what extent Mr. Wolf's departure from your point of view has penetrated the skulls of some of you, nor to what extent in any of your plants it may hereafter be applied; but the fact that I could come to a Taylor Society meeting and hear what has been said, the fact that there seem to be some among you anyhow who have the same point of view from a different angle as I have, leads me to believe that maybe the Taylor System can some day be reformed so that the man who made it won't know it.

Mr. Richard A. Feiss:[1] I am very sorry, as you are, that Mr. Cooke was not here to present his subject, because I think that all of the discussion so far, from what I know of Mr. Cooke and his paper, has fallen far short of the mark, just as Mr. Portenar's very honest disagreement has fallen far short of the mark of what Mr. Taylor was and stood for and what the Taylor Society means.

I shall try to enlighten our guest from one point of view. I do not want to take the time to convince him nor to start an argument at this time, but in justice to Mr. Taylor and to Mr. Portenar also, I want to say this: that a lot of misunderstanding on the part of most intelligent people has been just such misunderstanding as Mr. Portenar has of the real spirit of Mr. Taylor and his system. The reason that it survives and has found its place in history is because the Taylor principles are proper principles for the development of *men*. That is a thing that is misunderstood. The fact that Mr. Taylor was very gruff in his manner, very direct towards his friends has had some influence also. The hidden motive of Mr. Taylor was not always disclosed. He hid behind a real modesty, and I am afraid he sometimes displayed unintentionally a rough exterior when in an argument, covering up his human side which vibrated in every fibre of the man. We do not disagree. We just misunderstand. It appears that neither Mr. Portenar, from what he himself has said, nor Mr. Drury, has had a thorough acquaintance with Mr. Taylor or his principles or the way in which those principles have actually worked out. This is all. They are only talking theory now as it seems to them to work out in a general way. If they really understood and saw the thing working there would be no disagreement. I can throw a little light upon that from Mr. Taylor himself. He once said to me:

> "Feiss, you know there would be no disagreement if people just understood each other. There is nothing else to this thing; it is merely a question of words, of language. If we could only make ourselves understood there would be nothing to it."

So here is Mr. Wolf who seizes upon what I think is the meat in the nut of Mr. Drury's argument and is also the big mistake; that is, the idea that scientific management secures individual efficiency through restraint and not through opening the way for individual self expression, etc. The idea is not a mistake, but the fact of making it the basis of a discussion of the Taylor system is a big mistake. It shows an entire misunderstanding of the real thing, the heart of the situation. He is talking about the old style stuff that Mr. Taylor devoted his life to getting away from. That is what he is talking about. Mr. Wolf himself stands for what Mr. Drury here says, but he misunderstands that this is put here in the light of criticism of the Taylor principles or the Taylor Society if you wish. As such it cannot stand.

I question some of the other things that have been stated here. There is altogether, in my opinion, too much said about this question of self-expression—too much said that is meaningless; there is too much vague criticism on this score. Mr. Wolf has taken the trouble to try to give us a concrete example. I do not disagree with him in anything; I heartily subscribe to it, the same as Mr. Portenar does, the same as Mr. Taylor would if he were here, and the same as all of you do,—but here is a man who is talking about the question of initiative and the joy of the worker in it. Now let us get down to a few facts. The moment that he is through speaking about it, Mr. Wolf shows us the information relating to an operation on a chart that no workman in the world could produce on his own initiative. I do not see the consistency in his statement that certain things are left to be done by the worker in order to develop his initiative and then going ahead (as he shows us) and doing all that he can to standardize the job and to procure all the information necessary, things that the worker would not be able to do if left to worry about on his own initiative.

Mr. Taylor in his writings has said that initiative has a place, that it should find its place, and should be encouraged and rewarded in the proper time and in the proper way. But initiative is not the only thing by which business lives, and we must not give it a place in business out of all proportion. It has an important place in the Taylor system of management, and the system of management which we know as the Taylor system is *the only system of management that has provided a proper field for initiative.* Mark that. It is not merely a matter of practice. It is inherent. Initiative on the part of the worker is both provided for and rewarded. It is essential to the practice of scientific management to functionalize business and to create definite fields of responsibility along which initiative must be exercised. It must be exercised along given lines, in the planning department, which, as Mr. Hathaway has illustrated, must be made up almost entirely of men from the plant who show initiative.

Men who have initiative are not in the majority; they are a small minority, and they are hard to find. Those men are not left to operate such machinery as is suitable to men without initiative but are generally put in the planning department where there is always a dearth of competent help. There is just as much play for initiative in the following of instructions as in the following of tradition, which is the only alternative which has been offered. In the second place there is much more opportunity for the use of initiative, in fact, there is necessity for it in the devising of instructions.

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[1] General Manager, The Clothcraft Shops of Joseph & Feiss, Cleveland, Ohio.

I call your attention to what Mr. Wolf said when he went into the scientifically managed plant in Syracuse, the plant where Mr. Babcock has done such excellent work. He said that time studies there were made in co-operation with the workmen. There is no other kind of time study, none that can be made without his full co-operation. You cannot do it without him. He not only performs the work, but in ninety cases out of one hundred you adopt his ideas. With your training and observation you help to determine best methods. Eliminate the waste, that is all there is to the game. It is a means not only of securing co-operation; it is the only means yet devised for securing a measure of co-operation. So far as I can see in Mr. Wolf's proposition he is going just as far as possible to produce accurate instructions. This does not in any way interfere with the initiative of the man, and the only example which is left in the slightest doubt is an example of such a nature that I believe it is too intricate to pay for the trouble involved. That is my honest opinion about it.

Now take Mr. Wolf's theory in the abstract. The thing that I want to show you is not that Mr. Wolf is wrong, but that in trying to make a distinction he is wasting effort because the distinction does not really exist. If you take his own theory in the abstract that there is a certain field that should not be subject to instructions, then if you are going at it scientifically, you have to use scientific means to determine what that field is. There you are. That is the whole thing. That is just exactly what we are doing.

I want to get down to more specific answers to some things, especially to what Mr. Portenar said, not that I wholly disagree with him,—I agree with him a great deal more than Mr. Portenar can possibly realize. I agree with him partially because the written word, even Mr. Taylor's best written word, as well as that of everybody else, does not adequately express the spirit of the thing. I have a conviction, based somewhat on knowledge, that it does not in this case. The assumption has been, since so much publicity has been given to this matter recently in certain connections, that everything that has been written on the subject has been an explanation to the labor unionist. Nothing of the sort. He was left out of all consideration when Mr. Taylor wrote his book, i.e. out of all consideration from the point of view of explanation. There are other sides that oppose the idea of scientific management and oppose it more than the laboring man, more than he did at that time, more than he does now, although certain branches of organized labor oppose it through misconception,—and for political reasons also, if we tell the truth. The men from whom Mr. Taylor at all times met the greatest opposition, and the men who today are the greatest obstacle to scientific management are the capitalists and managers themselves. You must realize that Mr. Taylor wrote his book for the purpose of convincing them, including engineers who have not seen the light, that *it paid them dollars and cents* because they are capable of thinking only in dollars and cents. He did not think that fellows like you, Mr. Portenar, needed that kind of argument. You must realize that those of us who are going after things, because we have to,—because we have to if we properly perform our duties and responsibilities must take into consideration all the elements, and there never was a man who gave more consideration to all the elements than did Mr. Taylor. You have only to read the last statement in his book on "Principles" to see his entire sacrifice to the cause. You need only think of that wonderful expression of his, "I can no longer afford to work for money," to get the spirit of the thing—an idealism as high as that which inspired the greatest leaders of the Church in the Middle Ages.

That being true, let us get at the point of view which makes us see the thing right, in justice to the man who devoted his life to the work. What is the right point of view? Mr. Taylor has made us all think a little differently and a little harder in the right direction though many of our minds are still imbued with traditionalism. This is my suggestion. If you will get out of your minds the traditional idea or the traditional word "authority" and replace it with another word, "responsibility," your vision will change and you will begin to see this thing. This is a system of concrete responsibility. The responsibility extends itself into finding the true laws that govern every relationship in industry.

As Mr. Taylor so often explained, the responsibility is first to get accurate knowledge and then to act upon it. This involves the responsibility of co-operating with and teaching the other fellow to assume his share of responsibility, and that is the great thing back of scientific management, putting all men on the same plane. All are responsible for their share and that share is not measured by man made law but by the basic or generic law involved. This is of the true essence of democracy.

In conclusion I wish to say men do not devote their lives to machinery or materials as such. If you had thousands of bales of goods which fed themselves into hundreds of machines, there would not be a job for a manager. There would be no scientific management, but the minute you have twenty, thirty, forty or one hundred people to handle those materials and those machines, you have a management problem. Management, consequently scientific management, concerns itself primarily with human beings. It took Mr. Taylor and those who assisted him some twenty years to find out the laws of cutting metals. It took an inspiration from heaven for my friend Mr. Barth to express their cumulated knowledge. (It will take another inspiration for me to understand them). But all of this was conceived on the basis of obtaining accurate knowledge and using it as a proposition of management. All this kind of thing is in the spirit of making a man use less of the sweat of his brow to produce more of the wealth of the world. It is all done to serve the man. Any time that you do not realize that scientific management deals with the improvements and the true laws governing all things, tools, materials and conditions which surround the man who works in order to make every stroke of his hand and every move of his finger count for more so as to bring him and all concerned greater rewards, then you have an entirely erroneous conception of Mr. Taylor and the Taylor system.

Mr. Edwin Devine:[1] My qualifications for discussing scientific management are precisely those of a colleague of mine in my early days in university extension. He was asked what he knew on a certain subject. He said he didn't know anything about it, that he had not even lectured about it. While I have one or two side lines, my principal occupation is that of a profession which the President of the United States is very fond of holding up to ridicule, because he himself once belonged to it, I suppose. He did it again last night before an audience in Washington. He described an address, a very able address given by a college professor, and some practical hard-headed business men—engineers they may have been—who heard it were very much astonished because it was a good address. One of them said to the other, "That man has brains." The other said, "Yes, he has." "Well," the first one said, "how do you account for the fact that for twenty years he has been hanging around a college."

I came into this room in a spirit of great humility and teachableness. My friends Mr. and Mrs. Hall have for some time been trying to get me to a place where I would have to find out something about scientific management. To-night they succeeded. I shall remain in this state of great humility modified by appreciation as long as I am within the hearing of anybody in this room. The appreciation will remain; the humility will disappear, because as soon as I get hold of any students or other audience that happens, like myself a couple of hours ago, not to know anything about scientific management, I shall have a lot of things I can tell them. I shall not be humble any more.

It really is an extraordinary spiritual experience to hear scientific management discussed in the way in which it has been discussed in the speeches to which we have listened. Perhaps you all discuss scientific management in this way. This is the first meeting that I have attended. One hundred percent of all the discussion that I have heard about scientific management is of a very high degree indeed. There would be no excuse for pushing me out in this way, wholly without warning, wholly without preparation, wholly without any qualifications to discuss scientific management from the point of view of business, if I did not respond to the suggestion that your Chairman has made, that what you really want is my re-action, what you really want is possibly, if I can do it without offense and without betraying my ignorance in too crass a way, to raise a question or two, possibly a single question that arises in my mind.

I had not any doubt before Mr. Wolf finished his address that scientific management places ample emphasis upon the human factor. It is a humanizing influence in business. If I have ever had any doubts about that in the past, they have been resolved by the way in which you have received the remarks made by two or three of your speakers this evening. I think, however, that I shall go on from the point where the trade unionist[1] left his case. In accepting what Mr. Wolf said, as satisfying his objections and as indicating a complete change of heart,—(if that were necessary on your part,—) I think that what Mr. Portenar will do when he thinks it over will be to raise and press again the question, not whether scientific management is humanizing, but whether the human relation between employer and employee is quite compatible with a system of despotism. I have in mind that system of authority, that system of despotism, of authority modified by responsibility which does not yet have in it the element the trade unionist really wants to have in it and is justified in having in it.

There is another thing that goes beyond the humanizing element, i.e. the element of industrial democracy. Even when you have gone to the utmost extreme in developing the initiative of the individual workman, in giving him opportunity for the greatest scope of his creative impulse, you have not yet on a frank, square, man-to-man basis taken him into partnership in determining the questions which he thinks and justly thinks, from my point of view, he ought to have a voice in determining. That is the question that I would press.

I think it will take another afternoon and another evening for a full consideration of whether you have sufficiently modified your point of view to meet that demand for industrial democracy, which I hold to be a relative and not an absolute term. I do not associate it with any fixed Maxian conception of the use of the State machinery, the political machinery, for production and distribution. I do not think that it need be so associated. It is a relative term. Have you in your conception of the relation that should exist in industry incorporated as much of the element of industrial democracy as present conditions demand in our American communities should be incorporated? That is the single question I would raise.

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[1] Secretary, New York School of Philanthropy, New York City.

[1] [Mr. Portenar—Ed].

I do not know that I can do any better than refer to a remark of the President of the British Trade Union Congress held in England this year. He pointed out that there are two specific questions that have to be dealt with in business. There are questions relating to the purchase of materials, accumulating, gathering together of materials, and the marketing of the product. He said that those are questions for capital, as industry is now organized, to settle. The laborer does not think that he has any particular standing in the consideration of those questions. But there are many other questions in industry, questions of wages to be paid; as to the hours of work; as to the protection to be given from the dangers of machinery; as to the conditions under which new machinery shall be installed, and a whole lot of other questions of that kind in which the laborer feels that he is a partner and should have an equal voice in determining with the man who represents capital.

As I listened to this discussion it seemed to me that the remark of the president of the British Trade Union Congress was not complete. He should have put along with the question of the assembling of materials and the marketing of products as business questions for the management to decide, such questions as, "What kind of instructions should be given?" as indicated by the diagram placed before you, which was typical I suppose, of the chief questions that engineers and scientific management are interested in. I can see that instructions are better than traditions, even if you have to choose between those two in absolute form. I can see that the man who is responsible for the maintenance and carrying on of the business has to have probably a preponderating voice in determining what the instructions shall be. Therefore, to carry this analysis made by the President of the British Trade Union Congress a step further: you managers will probably have the greater part in the decision as to what instruction shall be given in technical processes, along with the question of assembling of materials and marketing of the products. Even when you do that, you will have a large number of important questions which should not be settled on the basis of deciding in your own mind how it should be done, even by subtle persuasion or psychological processes, which may be imposed upon the employees personally one after the other until they believe that your decision is right. You will recognize that there is a process of thinking and wise decision going on among the laboring men themselves, and it is essential that they should be taken into a kind of ground floor partnership for decision as to how these questions shall be decided.

I recognize that instructions are better than traditions, and yet—it may be old fashioned on my part—I have a certain liking for, and I am inclined to give a certain recognition to, the value of tradition in industry. I believe that it would be a good thing if every man who buys any commodity in a retail store could feel that there is behind the manufacture of that commodity not only the very best judgment which a business man and engineer could form as to how that commodity could be produced, but also a long tradition, a high and honorable tradition, on the part of the working men who have co-operated with the business man and manager in the production of that commodity as to how that commodity should be produced. There was something of value in the old traditions in regard to manufacturing. A tradition might include the idea of initiative; a tradition may include the notion that the very best method of producing the thing should be worked out in co-operation between the manager and the employees. So, in any general conception that we have as to how industry should be organized in that ideal state of the future to which we all look forward, it seems to me that there will be a large place for instruction, also a certain place for tradition.

MR. HENRY P. KENDALL:[1] This series of meetings has been a great joy to me, for several reasons. Every year that this Society goes on its conception of industry grows beyond the four walls of the shop. I am particularly glad that Mr. Portenar is here. I am glad to have a trade union leader—a man who has intellectual candor and honesty and courage. I am glad that he could step in to this inner shrine of scientific management and hear from those within what they think about; what their ideals are. I am glad to have the college professor, the sociologist, the man of sociological and economic viewpoint introduced here, particalarly so in view of certain semi-facetious allusions to modern economic thought and its place in the practical affairs of us engineers, and of the sociological viewpoint in the practical affairs of running a machine and getting the greatest output. I do not believe that scientific management is going to be truly scientific in its broadest sense, until it appropriates the best there is in fundamental economic thought and the fundamental principles of the social sciences, because, as Mr. Feiss and Mr. Wolf as well as others, have said, the machines are only part of the plant, and the operating of the machines and the making of the product in its final analysis comes down to the work of the men. So I am more than glad to see the economic and the academic viewpoint linked up with the best there is in science and engineering.

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[1] Norwood, **Mass.**

I cannot help feeling that the kind of a reception that Dr. Devine's remarks got tonight was a very different kind of reception from that which the same idea got one year ago to-night. I will confess that our viewpoint toward organized labor, toward the responsibility and rights of the community, towards the rights of the employees, toward the responsibility of the management among those of us who are responsible in a way for the management of the Plimpton Press has undergone a very decided change in complexion in the past eight or nine years during which time we have been working in the spirit of scientific management. I believe part of that is due to the fact that we all, men and management alike—and you cannot tell where one stops and the other begins—have gotten into the habit of looking for the best way of doing things, and have gotten in the habit of keeping an absolutely open mind toward every element of fact. That I think more than any other has been the cause of our change of viewpoint. I hope that Dr. Person, in his wise and somewhat autocratic leadership of this organization will make an effort to mix in a little more even proportions in the future the viewpoint of organized labor, the training and the viewpoint of the economist and the sociologist; and if it is true that the perpetuity of the principles of scientific management are bound to rest more or less in the future with the colleges and the technical schools, and universities, that is even more reason why we, the practical engineers, should now begin to undertake the training of college professors and the sociologists. I thank you very much for letting me exceed the few minutes which our autocrat allows.

Mr. Portenar: When I received the invitation I was informed that the title of Mr. Cooke's paper would be "Who is Boss of your Shop"? When I heard that title I was like a war horse about to go into battle. I thought that I scented battle far off. I did not think it would be nearly as peaceful as it has been.

In the Hoxie report it is said—and I have no doubt it is truly said—that there are men in the scientific management movement who are actuated by the highest and most humane motives. But it said a whole lot of other things. The last word that I want to say to you is this, that the Taylor System is not tried out in this room in speeches, but in your shops. I will admit that I do not know all it is, unless and until I can get into those shops. The opinion I have formed, as I told you before, was based on the reading of Mr. Taylor's books, the correspondence that I had with Mr. Taylor and finally I assure you it was clinched by reading the Hoxie report and when I found Mr. Valentine had joined in it. I have heard several allusions to-night to a paper read by Mr. Valentine which seemed to have been the cause of more or less disagreement. I will never be satisfied until I see a copy of it.

The Chairman: We will see that you get a copy of that.

Mr. Kendall: I would like to relate a bit of history which I think Mr. Portenar would like to know, and which I would like to have this group know. Mr. Cooke wrote to Mr. Brandeis, now Justice of the Supreme Court, and asked him if he could tell him which was the best book on organized labor. Mr. Brandeis wrote back that there was only one book, unfortunately, and that was "Some Problems of Organized Labor," by Mr. Portenar. Mr. Cooke bought that book. He wrote me and told me about it. I bought the book. I could not take exception to anything that appeared in that book. Afterward Mr. Portenar met Mr. Taylor. Mr. Taylor was very much impressed with the interview. He long had wanted to get the leaders in the trade union movement to see the thing from the inside, which Mr. Taylor stood for, but he could not get leaders in the trade union movement to do it. I never yet have been able to get a leader in the trade union movement to come out to the Plimpton Press. Mr. Portenar has probably explained why this is.

Now what happened after this somewhat heated correspondence between Mr. Portenar and Mr. Taylor was this: we were at that time at the Plimpton Press having some labor difficulty. It was represented to us, "Here is a man, a strong trade unionist, in the typographic union who had been a leader or a chairman in the strike committee in New York." Mr. Taylor said, "Here is a man of intellectual honesty. Give that man a position in the Plimpton Press. I will personally pay whatever he cannot earn for you, if you will pay his going rate of wages. Will you give him the opportunity to go to the Plimpton Press and of working as a working man, and let him form his own conclusions from seeing scientific management somewhat badly applied and imperfectly applied at work in the Plimpton Press, so that he can see it without the guidance of any manager, absolutely by being a workman with the workmen, a trade unionist with the trade unionists in that establishment?" That was a mighty difficult question for us to answer. We got together and thought it over. We said, "Here, Mr. Taylor has done a lot for us, and he can have anything that he wants in the shop." We wrote and said that we would be glad to have Mr. Portenar come there and work in our plant, under any condition he would like to. We honestly hoped that would happen. It did not happen.

I hope some time some trade unionist leader will work in a plant where he can see the thing from the inside and form his own conclusions. I think it will do a great deal to do away with our misunderstanding, our failure to fully see each other's viewpoint that now exists. I hope this meeting, the spirit of it, may some time lead to that accomplishment. I thank you very much, Mr. President.

MR. PORTENAR: The offer never was made to me. I would not have you under the impression that it had reached me. I would not have you under the impression that Mr. Taylor asked me to do this and I did not do it. This is the first time I knew of it.

MR. KENDALL: We were asked and wrote back that we would be glad to.

MR. PORTENAR: It never reached me.

MR. KENDALL: We understood that you were coming up to look us over, and that you got as far as Boston. We heard that through labor circles. Is that true?

MR. PORTENAR: I intended to come to look it over, if I could get to Boston. I did not get there to do it. So far as going to work there under any circumstances, no one broached it to me. I would not have you or any one else under the impression that such an offer was made and that I refused.

MR. KENDALL: We were asked and consented. We hoped it would come about.

MR. PORTENAR: I never heard it.

MR. KENDALL: I will renew the offer now. I hope that you will come.

MR. R. B. WOLF: I would like to say in concluding my remarks this evening that while I have never worked with Mr. Taylor, it was my privilege to talk with him a number of times. I never left him without carrying with me the distinct impression that he was constantly endeavoring to get what he called the initiative of the workman, by making his work interesting for him.

I think one of his greatest contributions to the problem of management was the working out of a practical method of measuring a day's work, so that every man can know how much progress he is making. Unless the workman has means for recording his progress, he cannot do creative work. He is, therefore, *entitled* to be furnished with a means for measuring the results of his efforts.

I think Mr. Portenar does not realize to what an extent the recording of operations helps the workman to do his work more intelligently, and furthermore, I believe that he is not aware how necessary these records are if the men are to be given a chance to enjoy their jobs. A management that is endeavoring to do things of this kind for the workman must inevitably *come* to take the human element into account to the fullest extent.

Mr. Feiss stated that it was not possible to make a time study without considering the men. I have no doubt, from what I saw of his organization, that *he* considers his employees to the fullest extent when making time studies; but there is no use blinking at the fact that time studies *can* be made and *are* made without the full co-operation of the workman. I find in our own plant that there is a constant tendency to determine standard methods more or less arbitrarily and it is necessary continually to emphasize the necessity for guarding against this tendency.

Just a word in conclusion: we must accept either the illogical premise that industry exists that the few may accumulate wealth by the labor of the many, or that its main function is to furnish a field for the development of men. Acceptance of the latter point of view means that we must plan our industrial organizations so that the men in them can express themselves in their work and thereby accumulate experiences which will enable them to come into a fuller realization of what life means. It is in reality a process of unfolding the inner spiritual consciousness by the externalization of inwardly conceived ideals which are striving to express themselves in the world of material things, through thought into action.

A NOTE ON ROUTING

Illustrating the Need for Standardizing the Nomenclature of Management Engineering

By Morris Llewellyn Cooke[1]

To Louis Pasteur is credited a recommendation to the effect that technical and scientific men should report at quite frequent intervals on the results of their studies and labors. In this country we work under a somewhat different theory. I remember being told by a savant in the physics laboratory at Harvard that once in ten years was about the rate at which so-called productive scholars could most profitably bring out papers.

During the next few years at least I believe that it will pay the Taylor Society with its limited membership and with its new and vast field to take heed of Pasteur's counsel. We can best perform our task it seems to me if our members will but take us into their confidence as their work goes along and at relatively frequent intervals. While any technical society needs papers which are more or less complete, even exhaustive, treatises on the topics discussed still the science and art of management has obviously not arrived at that stage where many papers of this general description are possible. I hope therefore that we can induce an ever increasing number of our members to feel that it is incumbent on them to describe at more or less regular intervals some development in their own work or thinking and without the effort at either too formal a presentation or claiming too much importance even for the subject treated.

It is in some such spirit that I suggest that the time has more than arrived when it will be advantageous if we management engineers seek more definition in our nomenclature. For purpose of illustration I want to list a few terms used in that part of our field which we have been in the habit of referring to as "routing" as for instance on page 19, February issue of the Bulletin[2] where Sanford E. Thompson alludes to "the various functions of planning, *routing*, inspection, training of the workers and so on." Precedent certainly warrants this use of the word "routing."

Any close thinking however, on the subject of "routing" will show that we have been using the word in two absolutely different senses, the one much more inclusive than the other. In the sense which Mr. Thompson used it the word seems to include within its scope all those acts and mechanisms by which men and materials are moved within a plant in furtherance of the general object of getting out the maximum product in the shortest time at the least cost. "Routing" is simply one of those grand divisions into which we have subdivided management such as (1) time and motion study, (2) inspection, (3) research, (4) stores, (5) cost keeping, (6) instruction card work, (7) improvement ,(8) personnel, and others. The art and science of routing so conceived can in turn of course be sub-divided into certain minor functions such as order of work, production, scheduling and what I will call for the moment "routing proper" to distinguish it from the word "routing" to which we have given the broader and more inclusive significance. Before taking up in turn several of these subdivisions of routing and their nomenclature allow me to call attention to a further important fact in regard to the use of the word "routing."

So far as I know there is no series of terms which comes anywhere near listing or including all the major functions of management. The whole subject is so new and our literature so incomplete that every writer in this field has been forced in describing the ultimate divisions of the subject to be more or less hazy. At no point have we been more so perhaps than in the use of this word "routing." I take it that there would be a fairly unanimous opinion as to many subfunctions to be included in the "routing" division. But each one of us doubtless would both include within its scope and exclude therefrom some elements upon which at first at least no general agreement could be secured. We would be led to do so through the influence of our own practice. In blazing the way to higher standards of efficiency in management our leaders are necessarily not all following the same road though the direction is for the most part at least the same. It is only natural then that one man puts the emphasis and his thought here today and there tomorrow. Another equally competent and equally well versed may reverse the process. But the ultimate end will probably be the same in both cases. The trouble probably lies at the moment principally in the fact that we do not clearly recognize as definite subfunctions of management certain of the less obvious parts of our work. Necessity sooner or later will force all of these functions and sub-functions into the open where they can be clarified and standardized and described in words and thus become generally not only noted but comprehended. But it is just as well that we should clearly recognize that the word "routing" as used by Mr. Thompson is at present an elastic term. It is in reality little more than a symbol leading us on to further definitions. I am not sure that we should not seek an entirely different word with which ultimately to express the idea we are now struggling to visualize and to limit For reasons suggested later the word "flow" would have much to recommend it.

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[1] Consulting Engineer, Philadelphia.

[2] Vol. III, No. 1, February, 1917.

One reason for questioning the propriety of this word is that we already use it in a more restricted and definite sense in describing the sequence of operations on a piece of work. On a machine part for instance we do the routing when we determine the most advantageous sequence for performing the several operations upon it such as drilling, turning, milling, etc. This is the use of the word which gives the names to our route charts, route sheets, route files, etc. Let me in the smallest possible space and without any effort at formal or final definition mention some of the other terms which occur to me as affording the basis for sub-functions under the general division of "routing."

Order—or *order of work* as we usually express it —has to do with the sequence of operations as between two or more jobs. Considerations of *"routing proper"* may dictate that the drilling on a given piece be done before the turning. Considerations of *order-of-work* however may suggest that as a given lathe is about to become idle and as the drill presses are all full that the usual order be reversed. Then Mr. Gantt has familiarized us with the term *balance* also usually expressed *balance-of-work*. One of his early papers before the American Society of Mechanical Engineers was largely devoted to this subject. Mr. Taylor used the underlying idea of *balance-of-work* in his work. Essentially *balance* is a scheme by which in the manufacture of a more or less standard article such as locomotives daily, weekly and monthly balances of required work is kept between departments.

Production is another word probably poorly adopted to express the ideas which underly it. The word production has such an important meaning in the whole science of economics that its use here in such a limited sense is probably a mistake. In my own mind considerations of *production* are those which only indirectly have to do with the actual doing of the work. *Production* plans are made at a conference between the financial, selling and manufacturing ends of the business. If the concern is short of funds for instance the financial man will ask that the work in which the greatest amount of money is tied up be pushed to early completion. On the other hand the selling man may have a disgruntled customer for whom he wants some special service in the way of expedited deliveries. Or the manufacturing man may feel that too large a proportion of the work has been "promised" for given dates in order to allow of economical manufacturing. These are simply typical considerations which occur to me as illustrating my conception of the field of *production*. The word *promise* used above has a definite routing significance.

Included in *progress* are those mechanisms and considerations which have to do with recording the state of advancement of items of work grouped after a certain fashion. On our *progress* sheets the records are not kept in such detail as on our route sheets. *Scheduling* is still a different function but is usually somewhat related in character to both *production* and *progress*.

Another term that may perhaps be ultimately included in the lexicon of "routing" is the word *control* as used at the Franklin Automobile Co. It is a term I am not familiar with but from what Mr. Babcock has said it would appear to be a sort of complex of some of our other and more familiar terms. One of the objects of *Control* seems to be to avoid too early purchase of materials.

The word *work* itself seems to have or can be made to have a more or less technical significance in this field. I think we have used it too much and that it is probably superfluous as usually used in such terms as order-of-work, balance of work, etc. The whole point of this memorandum will be lost if friends who are good enough to comment on it object to my definitions. My reply to any such critic would be to simply insert his own definition in place of the one I have used. The argument would remain the same.

Perhaps one of the most interesting sub-functions of "routing" is one which I have had the temerity to name *"complexion"* or *complexion of work* if we are to follow precedent. Mr. Feiss uses a certain group of considerations at the Clothcraft Shops in determining the proportion of different models of men's suits which he puts through in a given batch. Obviously if all the work is of a kind which requires skill in its execution the total output of the plant will not be as great as if the proportion of skilled work required corresponds measurably with what might be called the skill modulus of the plant. The moment we give attention to such a consideration we discover that skill itself as a factor in "routing" has several varieties. There is for instance the skill required to perform a genuinely difficult task—one for instance demanding extreme physical dexterity. Then again there is the skill required to do something which has never been done before, the capacity to study out and perform novel tasks. Some people are almost devoid of such capacity. But the skill factors are not the only ones which enter into *complexion*. The demands on machine equipment and even total quantity of work per unit of output are simply two further examples of the other factors involved. Mr. Feiss has made a very interesting original and valuable contribution to the science of routing in this work on what I have called *complexion*. There are many lines of work—book manufacture for instance — where these same principles are obviously applicable.

Other terms properly pertaining to this general part of our field occur to me as they doubtless do to you. But perhaps I have listed enough of them to warrant the suggestion that it would be profitable if we could take stock of what we have, determine which if any of these terms are to be changed, and make the attempt at least roughly to define those which are to become the basis of an ever enlarging art and science of "routing."

The industrial world is waiting for a text on "routing." It is much more urgently needed than are books on time study of which we are apt to have too many within the next ten years. The novice rushes to the stop watch as the solver of all difficulties. When used prior to the development of an adequate routing system time study simply gives rise to a new brood of troubles. I wish I knew that an adequate book on routing was shaping itself up in some author's mind. No greater service could be rendered to scientific management than to produce such a book. Perhaps a meeting of the Society where most of the papers were devoted to this one topic would lay the foundation.

My own conception of routing in management suggests an analogy to stream flow in hydraulics. The volume is the product of the cross section times the speed. So in industry our volume of production is the quantity of materials and work going through as affected by its speed. Routing or flow is the art and science of studying and controlling this stream.

"PHYSICIAN, HEAL THYSELF!"

A Plea to Reduce the Waste of Our Own Effort By Better Co-ordination.

By Henry W. Shelton[1]

To apply to ourselves the same principles of good organization which it is our effort to apply to others would seem obviously desirable. Our Taylor Society is called "a society to promote the science of management." Yet, like the proverbial shoemaker's children, in our solicitude that other organizations be well-shod we are in danger of going barefoot ourselves.

It is said that the progress of civilization rests on the ability of one generation to profit by the recorded experience and discoveries of those preceding. If our Society is to be not merely an ephemeral expression of the interest of its members it must consciously undertake to perpetuate the best of the past and to build better for the future. Mr. Taylor in his last address on "The Principles of Scientific Management"[2] says, as he vividly pictures the attitude of the surgeon toward his student, "Invent so that you can invent upwards, do not go inventing things which we discarded years ago." How are we fulfilling this duty? How are we protecting ourselves from duplication of effort? What kind of a standing order file are we preparing by which to measure the value of future proposed improvements? Have we a planning department to co-ordinate our various activities?

Care has been exercised, rightly and successfully, to keep the work of our members on the highest professional plane and prevent its becoming so commercialized as to lose its vitality. At the same time, is not all professional work successful in proportion as there is free interchange of discovery and idea for the equal benefit of all? The most respected professions are those which have no corners on information but which make available for the service of man their entire progressive achievement.

As a result of this effort to keep our activities on a high professional plane the work of our members is individual and independent. This is right, as responsibility must be individually assumed. Our work is also, however, too much isolated and this is a weakness. At present our members who are engaged in working out their individual problems of organization are, many of them, working independently on identical problems without knowing it. As they develop their individual solutions independently, their solutions may be largely identical and yet are achieved separately with all the expenditure of time and effort necessary for any original research. Are we not doing just what Mr. Taylor warns us against and, by hard labor, discovering individually many things which have already been discovered before? Why are we not aware of this duplication of effort? Simply because we have no organized means of comparing our problems and our progress in solving them with other solutions, past or contemporaneous. In a manufacturing plant, we recognize the folly of failing to record the results of all investigations so that new investigations may start where old ones stopped. The methods of elementary time study illustrate the proper application of this principle within an industry. Yet have we not largely failed to apply this principle as between different industries and more particularly between the work of our different members?

Unquestionably a few of our members of wide experience and contact are in rather close touch with the best that is being done in the field. Even their knowledge of the field as a whole, however, is largely fortuitous and their own intense activities and heavy responsibilities prevent the utilization of this knowledge most freely for the general welfare. How often do these few—the walking encyclopedias of the movement—meet the whole body of our membership?

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[2] See Taylor Society Bulletin, Volume II, No. 5, December 1916, page 13.

How is our interchange of information now achieved? Aside from the limited number of definite papers and their discussions at our meetings, it is most casual and haphazard. Part of our number get together at our four or five meetings a year. Sitting informally at luncheon, wherever convenient, one will make a chance remark upon which a neighbor may seize, ask more, and get a real bit of help. Or another may come a long distance planning to ask someone qualified a particular question and find that person not present. Is not such means for the spread of experience and judgment altogether too accidental? Are we not continually violating Mr. Taylor's second ideal of good management i.e., such standardized conditions that the task can be performed with certainty?[1] Does not this mean an unnecessarily high labor cost for our own production? Should we not so standardize our own inter-relations that our individual and collective progress in the science of management may be achieved with maximum certainty in minimum time?

We apply good principles of organization and management to others,—why not to ourselves? In our activities we have no excuse for falling into the old error of haphazard effort which can bring only haphazard results. We criticize the lack of co-ordination in those industrial activities which we undertake to organize. We establish planning departments to be the clearing houses of information for the various productive and experimental activities of these plants. Should we not develop and make effective a similar mechanism for co-ordinating our own individual efforts? For the sake of both present and future progress we need such a clearing house for our activities, investigations and achievements, where authoritative information may be sought and found.

Naturally any such co-ordination of independent professional work involves co-operation. The co-operative spirit in our Society is patent. No one who knows the movement can, for a moment, question the sincerity of this spirit throughout our membership. The instances of free and hearty cooperation, often at very considerable sacrifice, are such every-day occurrences as to arouse only the warmest admiration. What is needed, however, is some channel by which this fine spirit of co-operation may find most effective expression for the widest influence of good, and that, too, at less personal sacrifice with its consequent loss of momentum.

Most of the giving in the past has been, perhaps naturally, by those who had most to give. This has made the burden on them unduly great. I believe there is not a member of any grade who is not glad to give the best that he is and has for the general good, nor is there a member of any grade who has not something worth giving. The fact that so few in the past have done it is, I believe, because there is no clear channel for such giving. This channel the Society should provide.

As a beginning in this direction the four following lines of action are suggested.

1. The Society should expect from each member of each active grade (owners as well as organizers) as least once in two years the presentation of some paper. This may be nothing more than a report of progress or of experience, or the description of a problem which is being worked on. It is my belief that the practical help coming to each author from the suggestions and criticisms of his paper would prove such an incentive for further presentations that soon the problem of the Society would be not where to get such reports, but how satisfactorily to handle the number pouring in. Bringing our problems into the light of publicity and discussion will be a stimulus and help difficult to overestimate. To provide time for these discussions our meetings might be lengthened to cover two whole days and part of one day be devoted to round-table discussions on different topics.

2. The development of one part of the work of the secretary's office into a purely mechanical clearing house of information covering all the problems being worked upon by all the members. Each member would report on a list of all the problems on which he is engaged and, if possible, give some brief note as to the degree of solution. Such lists would be tabulated and published to the membership for their information. Individual members could then correspond with each other to ask particular questions, and get mutual benefit from the mutual discussion. Finally, when sufficient results had been achieved by anyone, these could be given out through the Society for the general use of members.

3. The establishment of committees or individuals to whom could be referred for authoritative reply or advice any question by any member. Most of such questions with their answers could advantageously be published in the BULLETIN.

4. The preparation and publication by the Society of a series of descriptions of standard practice and methods as concrete illustrations of sound principles. The accumulation of these individual publications together with the answers to questions suggested in

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[1] cf. "Shop Management" p 64 (Harper edition).

(3) would make an increasingly valuable work of reference. Mr. Mitchell's research in time study is an important effort in this line, much more elaborate than is considered in this particular suggestion. There are many well-established practices, however, which could be written up with comparative promptness and ease by many of our members, such as requisitioning, purchasing, balance of stores keeping, receiving, and stowing.

The writer wishes not to propose any too definite plan but rather to arouse the members to thought along this line and so make possible the formulation of a well conceived plan which will embody the best suggestions of all. Development, to be effective and permanent, may have to be slow. Nevertheless, the ideal should be clearly conceived and some definite steps towards its achievement agreed upon.